

mon British beetles and spiders. In dealing with either group he gives first a short general account of structure and habits, next an outline classification of tribes or families, and then a list of some common species with characteristics so superficially described that the promise "How to Identify Them" contained in the title cannot be considered as fulfilled. The 228 beetles chosen for listing are illustrated by natural-size photographs, most of which are too obscure to be of use. The larger photographs of some selected spiders, supplemented by four plates of outline drawings, are less unsatisfactory, but the front-view portrait on p. 50 lettered "Wolf-spider" is evidently taken from a jumping-spider (Salticid). The classification and nomenclature adopted for both spiders and beetles are those of the naturalists of fifty years ago.

Canning and Bottling, with Notes on other Simple Methods of Preserving Fruit and Vegetables.

By Dr. H. P. Goodrich. With an Introduction by Prof. Frederick Keeble. Pp. x+70. (London: Longmans, Green, and Co., 1918.) Price 2s.

IN spite of its modest size, this book contains a great deal of valuable information on bottling, canning, pulping, drying, and salting vegetables and fruit. In the first part of the book the author describes fully practical methods, while in the second part a brief account of the behaviour of bacteria and fungi, the micro-organisms which have to be fought by the preserver of fruit and vegetables, is given. The canning of fruit, which is extremely popular in America, but comparatively little used by amateurs in this country, is warmly recommended in regard both to the flavour and quality of the products and to the rapidity and simplicity with which the work can be carried out. The fear of tin and of ptomaine poisoning, which has prevented some people from canning vegetables, is shown to be entirely groundless.

The Stars, and How to Identify Them. By E. Walter Maunder. Pp. 64. (London: Charles H. Kelly, n.d.)

THE war has renewed interest in the constellations as guides for night-marching, etc., and several handbooks have been published for this purpose. Mr. Maunder gives here in a condensed form much of the information contained in his "Astronomy of the Bible" and his numerous papers on early Babylonian astronomy.

The constellations of the entire celestial sphere are shown in twenty-six clearly printed maps; the constellation figures are not drawn, but the stars of each group are connected by thin lines, which in many cases give some rough idea of the object the name of which it bears. A summary of the ancient myths relating to the grouping of the constellations is given, as affording a useful aid to the memory regarding their mutual configuration. Four northern and one southern key maps indicate the positions of the constellations at the various seasons.

ANDREW C. D. CROMMELIN.

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LETTERS TO THE EDITOR.

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Observations of Nova Aquilæ in India.

IN NATURE of June 13 I note that the earliest observation of Nova Aquilæ in England was made by Miss Grace Cook at 9.30 G.M.T. on June 8, and the magnitude was estimated as equal to Altair. In India the star was seen and recognised as a nova about five hours earlier by Mr. G. N. Bower in Madras, who has sent me his original notes made at 10 p.m. Indian Standard Time on June 8 (corresponding with 4.30 p.m. G.M.T.). Mr. Bower was occupied in pointing out the principal stars and constellations to a friend, and identifying them with the aid of Mrs. Evershed's "Guide to the Southern Stars." Turning to the eastern sky, he at once saw a star on the borders of Aquila and Serpens which he could not place. It appeared to be as bright as Altair, or possibly brighter, but not so bright or white as Vega. Altair was, however, unfavourably placed for the comparison.

At Jhelum, North India, the star was independently discovered on June 9, 3.30 a.m. I.S.T. (10 p.m., June 8, G.M.T.), by Mr. C. L. Dundas, I.C.S., who kindly advised me by telegram of his observation. He also estimated it as equal to Altair, but at the same time on the following night "it was apparently equal to Vega."

At Kodaikanal I was photographing the spectrum of Venus on the morning of June 8, and can state with some confidence that the nova had not then appeared, or perhaps it would be safer to say that it had not risen above the second magnitude. The sky was exceptionally clear that morning, and the brilliance of the Milky Way attracted special attention between 4 a.m. and dawn, about an hour later. Mrs. Evershed and myself were both observing the Milky Way, and both had the possibility of detecting novæ at the back of our minds. This narrows down the time of the outburst to between 11 p.m. G.M.T. on June 7 and 4 p.m. G.M.T. June 8.

The spectrum of the nova has been studied here in some detail, thanks to the partial failure of the monsoon in Southern India, which resulted in a good number of fairly clear nights from early in June to the middle of July. Two series of spectrum photographs were obtained simultaneously—a large-scale series with a 6-in. prismatic camera, and a small-scale series with a 2-in. prismatic camera, the latter showing considerable extension in the ultra-violet. By a special arrangement of the apparatus I was able to photograph a comparison spectrum of Arcturus accurately aligned with the nova, so that the wavelengths in the nova spectrum have been determined by reference to the lines in Arcturus.

On the nights of June 12-13 and 13-14 many of the absorption lines in the nova appeared to be in duplicate, and there are two series of hydrogen absorption lines, both enormously displaced towards violet; the wider, more refrangible series in H β , H γ , and H δ gives a mean displacement corresponding with 2700 km./sec., whilst the comparatively narrow, less refrangible series gives 1720 km./sec., both in the direction of approach. This is with reference to Arcturus, and uncorrected for the component of the earth's motion, which is very small. In later plates the more refrangible set

of lines has vanished, whilst the less refrangible set shows a slightly increased velocity, which on the night of June 19-20 was estimated at 1860 km./sec. This accelerating motion reminds one of eruptive prominences ejected from the sun, and, if confirmed, would indicate the action of a repulsive force.

The hydrogen emission bands are very intense and well defined in all the photographs, especially $H\alpha$ and $H\beta$, but in the ultra-violet beyond $H\delta$ they become feeble and difficult to distinguish, whilst the absorption lines are strongest and persist longest in the ultra-violet, where they have been photographed up to $H\pi$ on June 18-19. The $H\alpha$ line stands out isolated and without absorption in all the plates except the earliest one exposed on June 13-14. On this plate the continuous spectrum is faintly visible near it, and the two displaced absorption lines corresponding with the two velocities mentioned above are clearly shown. The $H\beta$ emission band on June 20 extends from λ 4834 to λ 4885, and within it are three maxima at 4857, 4864, and 4880.

The last plate secured was exposed on July 11, the star being then of magnitude 3.6. This photograph shows emission bands only, extending to $H\eta$, and there is no appreciable absorption, even in the ultra-violet. The nebula emission band at 5007 has greatly increased in relative brightness, in accordance with precedent.

Kodaikanal, August 6

J. EVERSLED.

THE "TAYLOR" SYSTEM OF "SCIENTIFIC MANAGEMENT."

DURING the last year or two much attention has been given to the results of analyses of industrial operations obtained by Dr. F. W. Taylor in the United States, and a system of scientific management has been based upon them. Advocates of the "Taylor" system claim that, by the thorough analysis and investigation of the actual practice of manufacture, it has been possible to deduce certain principles applicable to all industry. These principles are not so co-ordinated and developed as the laws of physical science, because, although the result of industry—the production of concrete material things—is physical, the actual process of production by human brains and hands is not a physical, but a social, process. Only those who maintain that social laws cannot be discovered which will explain and govern the actions of society can consistently argue that the "Taylor" principles applied to industry are not scientific.

In the early days of mechanical invention progress was entirely by trial and error. At the present day almost all invention is the result of laborious investigation and research, and the development of invention and design has been greatly accelerated by the application of scientific method. The complexity and minuteness of detail shown in the complete working drawings of a modern engineering firm would have been beyond the comprehensions of our forefathers, who could not decide such things on paper, but had to work by rule-of-thumb methods. The application of science to engineering design has made all this development a matter of course to the present generation. Science has made most headway in design, because a knowledge of the laws of the

strength of materials, and of magnetism and electricity, are essential to the design of steam and electric machines; and once a man is forced to use science as the basis of his work, he is more likely to evolve scientific methods in connection with the numerous details and routine of actual production. In this direction, however, there is still much that can be done, but the fact to realise is that in this field of human effort scientific method is accepted by practically all.

When we come to the actual purchase, storing, and handling of materials required for production, we find no equivalent to the modern scientific designer and draughtsman. We find a varied collection of buyers, storekeepers, and clerks. It is safe to say that very few of these types of workers have the haziest notion of what scientific methods are, or how they could be applied to their work. It is probably unfair to expect this, as they are all highly trained by rule of thumb. Planning and co-operation, which are among the basic principles of scientific management, are usually glaringly absent, and where production is not held up by lack of material, this is accomplished by prodigal expenditure and, consequently, inefficiency in the use of material. Nevertheless, method is accepted in this direction also, without much controversy. It is agreed that works should be built so that they can be easily expanded without mixing up all the departments, and laid out so that material can travel as continuously as possible from one process to another, until completed, with the minimum amount of cross or backward travel. It is agreed that materials should be purchased with some relation to the output, the time required to deliver, and the number of times to be repurchased in the year, so as to guarantee material when required, without at the same time locking up more capital in stocks than is necessary. It is agreed that stores should be large, roomy, and completely closed in, and nothing issued without proper requisition; and that men from the store should move material to the shops so that the time of the skilled men is not wasted seeking after material.

There are hundreds of systems for doing these things—in fact, each firm must evolve the one most suitable for itself; but the principles underlying all these varied systems are the same; and once a manager has a grasp of these principles he can quickly plan a system, and with time and continual care will get it to work. Buyers, storekeepers, and clerks have no scientific training, and, consequently, they seldom see the principles involved. To unscientific minds there is little or no co-ordination or correlation; everything is more or less in watertight compartments; they cannot see the extraordinary interdependence of all sections of industry. As, however, this type of labour is not numerous, and has no organised objection to improved methods, it is possible to improve matters comparatively quickly with a reasonable expenditure of will and mental energy on the part of the management.